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ABSTRACT

This paper discusses the critical shortage of math and science teachers in San Diego public schools and the necessary revision of the teacher preparation process to provide flexibility in expediting entry into the classroom of candidates with strong academic math/science backgrounds. U.S. Navy officers near retirement who have completed degrees in engineering, mathematics, or the physical sciences are the potential audience. The program encourages the active collaboration of many institutional partners (the United States Navy, San Diego State University, and San Diego Unified Public Schools) as well as of three academic divisions at San Diego State University. The project alters the current teacher preparation program by focusing much of the credential coursework on pedagogical content knowledge. Major project activities include: creation of an internship plan; development of a school-based site; and establishment of a staff and organizational structure. One of the characteristics of this program is the constant requirement for intensive contact with the candidates who seem to require a lot of support due to the trauma of leaving the predictable world of the military for the unpredictable world of higher education. Contains 5 references. (SM)

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NAVY FAST TRACK PROGRAM

Paper Presented at Association of Teacher Educators

20 February 1989

St. Louis, MO

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San Diego State University

A Project Sponsored by The Fund For The Improvement of Postsecondary Education (FIPSE)

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AASCU/ERIC Model Programs Inventory Project

The AASCU/ERIC Model Programs Inventory is a two-year project seeking to establish and test a model system for collecting and disseminating information on model programs at AASCU-member institutions--375 of the public four-year colleges and universities in the United States.

The four objectives of the project are:

- To increase the information on model programs available to all institutions through the ERIC system
- To encourage the use of the ERIC system by AASCU institutions
- To improve AASCU's ability to know about, and share information on, activities at member institutions, and
- To test a model for collaboration with ERIC that other national organizations might adopt.

The AASCU/ERIC Model Programs Inventory Project is funded with a grant from the Fund for the Improvement of Postsecondary Education to the American Association of State Colleges and Universities, in collaboration with the ERIC Clearinghouse on Higher Education at The George Washington University.

NAVY FAST TRACK PROJECT

Introduction

Recent international comparisons suggest that mathematics and science education in the U.S. is inadequate. A study of 24,000 13 year olds in February 1989 reported that the United States lags far behind countries such as Japan and Korea in knowledge of mathematics and science. What is more disturbing is the finding that we also fall behind countries thought of as less technologically advanced, such as Spain (L.A. Times, 1989).

Currently a serious shortage exists of fully qualified secondary school, math and science teachers. There is a high probability that this shortage will soon become much worse, particularly in the Far West United States (Darling-Hammond, 1984). Nationally, but especially in the Far West, the percentages of newly hired mathematics and science teachers who are unqualified to teach those subjects are alarmingly high and increasing steadily. In 1980-81, 75% of all Pacific states new-hire math/science teachers were unqualified to teach math/science classes. By 1981-82, the percentage had risen to 84% unqualified new-hires (Klein, 1982). These figures compare to the national average of 45% and 50% respectively for these two years.

In California the problem has been exacerbated because of the recent requirement for an additional year of science for grades 9-12. School administrators have been forced to use an unsatisfactory patchwork of temporary measures and emergency credentialling to staff such classes through the use of

unqualified teachers. In San Diego county districts unqualified crossover teachers are attempting to teach physics and chemistry, subjects in which they have little or no academic preparation. This is typical of the make-do solutions forced upon school administrators by the current shortage of qualified mathematics and science teachers.

In 1984, Darling-Hammond reported that the 1980 science teacher supply was down to 25% of that in 1971. That same study reported that the schools lost 9,796 math and 8,097 science teachers in 1981, and only 798 new math and 597 new science teachers were added in 1982. In other words, less than 10% of the teacher vacancies were filled by qualified new teachers in 1982. There is mounting evidence that the loss of mathematics/science teachers through transfer to jobs in industry, may amount to five times the loss due to retirement in the Far West States (National Center for Education Statistics, 1983).

If we extrapolate these trends reported in 1982 to the present date, the situation can be understood only as a critical shortage of a complex resource, mathematics/science teachers. It normally requires 4 to 5 years of cycle time from enrollment at the university to fully credentialed teaching in the secondary classroom. This cycle time is far too great to prevent the long-term destabilization of mathematics/science teaching in our schools. Experience has shown that an administrator can seldom make a fully qualified math or science teacher out of a non-quantitatively oriented crossover teacher, even when the

crossover teacher is inclined by preparation to quantitative subjects. Many hours of new study are required before he or she is to be considered as fully qualified to teach math/science.

There is a need to recruit significant numbers of academically qualified candidates from non-school professions and place them in math/science classrooms as soon as possible. One of the best sources of such candidates is our military service establishment. Naval officers frequently have B.S. degrees in engineering, math and the physical sciences. Many have additional graduate technical education and long years of experience, much of which is directly applicable to the teaching profession. Some have had formal teaching experience in the Navy. Unlike retirees from industry and related professions, Naval officers usually retire after 20 years to begin a second career while still in their mid-forties. With two decades or more of vigorous professional activity to offer, teaching as a second career is quite attractive to these retired officers. Because of their retirement pay, they can accept a lower paying second career. Our past experience in San Diego with retired military officers has been that they are well prepared and appropriately experienced for teaching careers, are greatly appreciated by students, are well adjusted in their teaching assignments, and stick with teaching as long as their health permits, frequently into their late 60's. They have typically brought superior leadership and organizational ability to their school sites in addition to a strong academic preparation. These former officers serve as important role models for their students.

Yet there have been too few retired officers who enter teaching. One of the important reasons for this is the formidable academic and professional courses of study which confront reentry teacher candidates. The inflexible pattern of requirements has largely ignored the skills and knowledge that these people bring with them, and has created a significant barrier to candidacy. When the retiree considers teaching it is too frequently the large investment of time at mid-life, and the lack of accommodation of their skills and experience inherent in rigid teacher preparation programs designed for the entering freshman, that turns them away from mathematics/science teaching.

Background

Shortages of fully qualified teachers in the teaching profession are not new. At various times in the past, critical shortages have existed, particularly in the areas of mathematics and science. What makes the current teacher shortage more crucial is the increasing reliance of our society on technology in all areas of our lives. The lack of qualified math and science teachers is serious in that it suggests that we may be increasingly less competitive with our international neighbors. In the late 1950s and '60s, such a loss of competitiveness was described primarily as a threat to our security, particularly in our continuing struggle with the Soviet Union. The loss of our national math and science capability must currently be viewed with even greater alarm. The competition we are now facing is not only with our traditional political competitor, the Soviet Union, but also with our allies such as Japan and the European

western nations. Our continuing loss of competitiveness in the international marketplace must be seen as making us "a nation at risk."

Proposals for non-traditional teacher training are also not new. In times of shortage, emergency credentials, shortened programs, and even the elimination of credentials have been used as a response to the shortage. Many of such approaches have not produced better teachers, only more teachers. There have been and continue to be fast track, internship proposals. Currently in San Diego, several teacher training institutions have proposed internship programs. These proposals have not been carefully considered and do not take into account the complexity of the institution of such programs. Before a fast track internship proposal can be successfully implemented, a number of complex issues must be addressed. For example, how will the internship program be different from traditional teacher training? What course content can be incorporated into such a program, and what new content might be needed? What are the roles of teacher educators, content specialists, public school teachers, and school district and county education specialists in such a program. How can such a program be designed to satisfy teacher unions? These issues are complex, involving institutions and individuals with very different backgrounds, perspectives, and imperatives. The question is not simply how to increase the number of credentialed teachers but how to increase the number of highly qualified, well trained teachers.

This project, sponsored by the Fund for the Improvement of Postsecondary Education (FIPSE), U.S. Department of Education,

is addressing the specific need of the critical shortage of math and science teachers in our public schools, and of the necessary revision of the teacher preparation process to provide flexibility in expediting entry into the classroom of candidates with strong academic math/science backgrounds. U.S. Navy officers near retirement from the Navy who have completed degrees in engineering, mathematics or the physical sciences are targeted as the potential audience.

The candidate pool is a demonstrably large one. Each year, 8,000 officers and 22,000 enlisted personnel retire from the military. A recent survey conducted by the National Executive Service Corps indicated that 79% of qualified potential retirees were interested in teaching as a second career. Carefully screened candidates will typically begin this experimental program by completing coursework and some initial fieldwork prior to separation from the military at the central project field site, a secondary school of the San Diego Unified School District.

The program involves the identification and counseling of potential candidates, specialized courses offered during the last year of active duty,a specialized training program of one semester and an internship teaching year. The training program will feature new specially developed course content; collaborative instruction by university content specialists, teacher educators, and public school practitioners; and the delivery of instruction at a field-based, public school site. The project will produce a professionally appropriate response to

the current shortage by creating a new and better training program for the preparation of mathematics and science teachers.

DESIGN OF THE PROJECT

This project is unusual in a number of significant ways. First, it encourages the active and cooperative collaboration of a number of institutional partners, including the U.S. Navy, San Diego State University, and San Diego Unified Public Schools. Furthermore, it encourages cooperation and collaboration between three academic divisions at San Diego State University, the College of Education, the College of Sciences, and the College of Extended Studies.

Second, this project proposes to alter the current teacher preparation program by focusing much of the credential coursework on pedagogical content knowledge, an emerging area of research interest in teacher education. Pedagogical content knowledge, first developed by Lee Shulman at Stanford University, is currently being explored at San Diego State as part of the Teacher Education Institute, a comprehensive project that seeks to encourage a radical restructuring of teacher preparation.

Third, this project is being conducted at a field-based site, where teacher educators, math and science educators, and public school practitioners can assist in the training of new teachers. Furthermore, a field-based site offers a laboratory environment in which theoretical models of teaching can be tested against the realities of a public school setting, an idea embedded in the recent Carnegie Report about a teaching hospital model for teacher training.

Additionally, this project will train students as a cohort, creating a mutually supportive environment for students enrolled in this program. Additionally, the cohort will be focused explicitly on math and science, thus offering opportunities for special lectures and discussions that are often not available in a generic, multi-subject teacher training program.

Finally, this project seeks to facilitate and accelerate the training of prospective math and science teachers, by providing individual counseling early in the program, release time during the final years of a military career for some prerequisite coursework, and a reduced training period, followed by one year paid internship.

The project is designed as a model demonstration project which would explore some of the problems and promises involved in retraining adults who are seeking a second career option in teaching. This model would be developed deliberately as a model which could be used throughout the California State University system's nineteen campuses, as well as elsewhere in the United States, both for the training of career military personnel who are leaving active duty and other individuals who are making career changes. The project's goal is to develop a model which is sufficiently cost effective that it can be operated at a number of sites throughout the United States without federal support by utilizing support mechanisms available within existing institutional structures of both higher education and the public schools.

YEAR ONE

During the first year a number of critical planning elements were considered. In cooperation with San Diego Unified School District, two critical issues were addressed. The first of these was the role of interns in the school district. The concept of interns is not new; however, the San Diego Teachers Association, like teacher associations in many parts of the United States, expressed some concern that interns might preempt teaching positions which should go to fully credentialed and qualified candidates. Therefore, negotiations had to be undertaken to insure that the structural arrangements that are made are acceptable to the teachers union. While the union expressed some concerns, they also indicated that they would support an internship program in areas of critical need.

A second area of concern was the careful development of a school-based site. San Diego State University has a history of teacher training at field-based, public school sites. However, the development of a new site required careful planning and considerable discussion between San Diego State University and San Diego Unified School District. In particular, the administrators and teachers at that particular site, as well as school officials in the central office, must be involved in careful planning to insure a successful school-based experience.

Another area of discussion involved the development of an agreement between San Diego State University and San Diego Unified School District about the internship program. The agreement would specify the contractual obligations of interns, as well as the role and duties of both institutional parties in

the selection, training, assignment, and even removal of candidates from the program.

While those discussions were going on, additional work was done in cooperation with the U. S. Navy. The Navy has agreed to serve as the dissemination agent for this program. They will assist San Diego State University, serving as a contact point for military officers interested in the fast track proposal. They will also identify military personnel and begin developing a file on each applicant. The file will include transcript and biographical data.

Meanwhile, at San Diego State University, the Project Director began reviewing files and determining areas of deficiency. Those identified deficiencies will assist in course planning for the remainder of the project.

Finally, during the first year the Project Directors identified prerequisite courses that are required for candidates in this program and began scheduling those courses at times and locations that are feasible for program participants. Some of the coursework was scheduled in non-traditional time frames through the College of Extended Studies at San Diego State University, offering applicants an opportunity to be released from their military assignments for short periods of time. Alternate modes of scheduling will be experimented with to find the most appropriate vehicle for the delivery of prerequisite coursework.

Throughout the first year, planning required extensive cooperation and collaboration between San Diego Unified School District (Assistant Superintendent, Personnel Officer, and site

personnel), the U. S. Navy, and San Diego State University (College of Sciences, College of Education, and the College of Extended Studies).

SECOND YEAR

During the second year of the project, the first group of students began their full semester of coursework preceding the internship. The coursework during this first semester involves traditional teacher preparation coursework, such as attention to issues like classroom management, lesson planning, etc. However, because the program will be based at a high school, the traditional separation between theory and practice has been minimized. Students in this program listen to a description of an exemplary classroom practice and then immediately have an opportunity to go into a classroom as an aide and observe that practice in action. Additionally, because all of the students in this group are focused in the disciplines of math and science, we can include methods of teaching which are content specific, rather than generic, a traditional criticism of many teacher preparation programs. Finally, because this program is school-based, instruction will be provided both by university faculty and by public school practitioners identified as specialists in their field.

In the second semester of this program (Fall 1989), students will actually begin their internship in a public school setting. Each of the students will have a mentor teacher identified as a facilitator. Additionally, each intern will be assigned a university faculty member as a supervisor. The public school

facilitator and the university supervisor will not be evaluators in the traditional sense. Their recommendations and comments will be separated from any evaluation process conducted by the principal or school district. The role of the teacher facilitator and university supervisor will be to provide additional support for this intern teacher during the often difficult first semester.

Certainly the support provided by the school district and the university will be informed by four current induction year projects at San Diego State University. Each of those, quite different in size and purpose, are examining the needs of teachers during their first year of induction into the teaching profession. The understandings that are being developed from these four very different projects will assist the fast track program to provide substantive support for its math and science interns.

THIRD YEAR

In the third year of the project, a second cohort group will begin its training cycle. Additionally, first cohort candidates will be extensively interviewed and debriefed to evaluate the program. Additional information will be gathered from principals, university supervisors, and teacher facilitators.

An additional effort during the final year will be write up the results of the project. The experimental design question opposed in the beginning of the study "Can an experimental internship fast track program produce qualified, competent first

year teachers?" will be assessed using the research design described above.

Finally, an extensive dissemination effort will be undertaken to describe this program and its results at local, regional, and national meetings.

Analysis of Major Activities

During the three years of this FIPSE project, a number of major activities have been and will be undertaken. Those activities included the following: 1. creation of an internship plan, specifying obligations and duties of each of the institutions; 2. development of a school-based site for the training of these prospective mathematics and science teachers; 3. publicizing this new credential program to prospective candidates; 4. reviewing files of applicants; 5. identifying prerequisite courses for applicants; 6. created an advisory group to review the work of this project; 7. applied for an internship program approval through the Commission on Teacher Credentialling; and 8. established a staff and organizational structure to accomplish the work of the project.

1. Creation of an Internship Plan

Negotiations were begun early with key San Diego Unified School District personnel to establish an internship plan. That plan has now been developed and approved by the Board of Education. The anticipated problems with the classroom teachers association did not occur, primarily due to the resolution of the contract dispute in March. The current plan calls for the placement of interns in high schools at 90% of full starting

salary. The remainder of the salary will be used to hire university and public school supervisors. This concept provides a mechanism for continued support for this program after federal support has ended. During the summer of 1989, those two sets of supervisors, university and public school, will be identified and trained in clinical supervision practices, along with their supervisees. That training will provide a common language for the three participants as the interns begin their program.

2. Development of a School-Based Site

Crawford High School, in the San Diego Unified District, has been identified as the first semester training site for these military candidates. Crawford High School, with a student population that is 30% white, 20% Black, 25% Hispanic and 25% Southeast Asian, provides an ideal context in which to learn about teaching today's children. Crawford High School will provide a room on campus for university coursework, seminars, lectures, and small group discussion. That room will be equipped with a Macintosh computer (for computer applications in math and science) and a video camera and playback system (for recording and viewing student teaching, as well as playing commercial presentations). Mentor teachers in mathematics and science have been identified who will be available to provide special lessons on teaching in high school settings. The support staff of the high school (including counselors, principal and vice principal, librarians and security personnel) will also offer special sessions for these candidates, to provide the most realistic and comprehensive view of today's high school.

3. Publicizing the Project to Potential Navy Candidates

Certainly much of our effort this first year has involved working with the U.S. Navy to publicize this new training program. The cooperation of the Navy has been excellent, accounting for much of the interest that has been expressed. We began our publicity campaign with a survey of those San Diego-based naval officers with less than three years left in their initial 20 years of service. That survey identified over 400 officers who expressed interest in a second career in teaching. Simultaneously, we also sent a message about our program to all U.S. Navy commands in San Diego, more than 280 separate units. We also wrote and distributed news releases about the program. Those news releases were published in the two largest San Diego papers (the Union and Tribune) and a host of smaller papers. An article published in the Navy Times generated enormous interest, with phone calls from all parts of the United States. In March, we hosted a invitational meeting of potential candidates at the North Island Naval Air Station Officers Club. The meeting was attended by four flag officers - commanders of Navy Bases San Diego, Long Beach, San Francisco, and Seattle - who are also interested in developing a similar program in their regions, as well as a Navy representative from Washington, D.C. The reception had over 65 attendees, officers and senior enlisted personnel who wanted more information about our program. We distributed more than 125 packets of information that night.

4. Reviewing Applications

Since that reception, we have received phone calls daily and have mailed out an additional 150 information packets. The first

12 completed applications have now been received and are being reviewed by subject matter specialists in both mathematices and science. Those subject matter specialists met with us for two days in January to help establish admission procedures, develop application forms, and create a joint admission process, using both teacher education advisors and subject matter specialist advisors. We hope to have the first group of candidates identified and completely admitted by the beginning of the fall 1988 semester, well before the beginning of the formal training period in January, 1989. That early admission will allow candidates to complete any course deficiencies during the fall semester, before the beginning of the on-site program. We will also have an informational meeting of all candidates in the early fall to begin developing a sense of community among these candidates, and responding to any questions or concerns they might have.

5. Identifying Prerequisite Courses

As the process of reviewing applications continues, we will begin to evaluate the current skills of these candidates. Through the development of a comprehensive data base, we will be able to identify any deficiencies that these candidates possess, and provide for remediation. A detailed description of that process will be available in next year's report.

6. Creation of Advisory Committee

The Advisory Committee has been established and has scheduled the first of its bi-annual meetings. The committee includes the following: the special assistant to the Superintendent, San Diego Unified School District; a staff member to Commander, Navy Base

San Diego; two teachers, one from each of the content areas, nominated by the teachers union; and three professors, representing science, mathematics, and teacher education.

7. Application for Internship

An application for this internship program was filed with the Commission on Teacher Credentialling in Sacramento, California. Formal Commission approval was granted in September, 1988.

8. Establishment of Organization and Staff

Establishing an organization and hiring of staff was a time consuming but important initial part of the project. That effort went smoothly, however, and work on the project started before we received funds. In part, that ease in starting was facilitated by the work of the SDSU Foundation, which handled many administrative details, particularly those issues that related to personnel hiring, benefits, etc.

B. PROBLEMS (ISSUES) FACED DURING THE YEAR

As we began this project, we discovered some problems and issues which need to be reported, even at this early, tentative stage. The issues that we found most significant included: 1. time; 2. scheduling; 3. interest; and 4. collaboration.

1. Time

The work of the project could not have been accomplished without the tremendous time commitment of the staff. Several key meetings early in the fall semester, even before the grant was awarded, facilitated the work of the project directors. Certainly the project has taken more time than we originally envisioned, particularly to coordinate the many activities occuring

simultaneously. As we began developing information packets, designing literature, and answering calls from Navy personnel throughout the United States, we quickly realized that we could not complete our work without additional assistance. In February, therefore, we asked for a budget change to make one of the project director's salary an in-kind contribution from the University, freeing up that money to hire one additional staff member for the summer. That change provided much needed additional support for the project.

2. Scheduling

We initially planned to begin the program in the fall of 1988. However, as we began to discuss the internship idea with San Diego Unified School District, we discovered that they could not find places for teacher interns for the second semester of the school year. Their vacancies occur, of course, at the beginning of the school year. Therefore, to ensure adequate spaces for our candidates, we revised our original plans and will now begin our intensive semester of academic preparation in Spring 1989, with the internship beginning in late summer 1989.

3. Interest

One of our very pleasant surprises has been the great amount of interest in this program. As was indicated earlier, we had over 65 attendees at a reception at North Island Naval Air Station. Newspapers also carried articles about our program, and phone calls have continued to come into our office, with a veritable weeklong flood of calls after the article in the Navy Times. In fact, our program, which was first discussed with school district officials in late 1986, even before we wrote the

first FIPSE proposal, stimulated the creation of a second, additional credentialling route for mid-career candidates through a program developed by the school district itself through support from the Carnegie Foundation. That program, with only a very small number of candidates, will be complementary to our larger FIPSE-sponsored project to build a permanent alternative to the traditional credential program at San Diego State University.

4. Collaboration

One of the most pleasing and unexpected outcomes of this grant has been the development of new collaborative relationships between departments within the university, and between the university and the public schools. Within the university, we have increased contact between subject matter departments and the School of Teacher Education, finding that we share a commitment to quality teacher preparation. In our contacts with San Diego Unified School District, we have also begun to establish positive working relationships that will provide mutual benefits for us in our collaboration to improve the quality of candidates that become teachers, both by better selection procedures and by better teacher preparation.

Continuing Issues or Concerns

1. Evaluation

As this was the planning year, few changes were made in the evaluation plan developed as part of the original proposal. That plan continues to appear both appropriate and workable. We are gathering large amounts of data on candidates considered and rejected, in order to have an appropriate database for later

evaluation purposes. We are also keeping detailed records on project activities, so that we will be able to describe the development of this project.

2. Mathematics and Physical Sciences

Most of our candidates have mathematics or physical science backgrounds. Few have backgrounds in life science, due to the work and experience they have had in their Navy careers.

3. Few Women and Non-White Candidates

While the military services today represent great opportunity for women and non-white personnel, many career Navy retirees now, who joined the military in the mid to late 1960s, are white males. This program will probably never provide many minority candidates for the teaching field.

4. Attrition

This program is but one of many opportunities available to military retirees. They are shopping when they leave the service, and as a consequence, attrition from first contact to actual enroillment in the program is unusually high. For example, we first advertised this program to more than 75 Navy officers at a reception at the North Island Naval Air Station. We also ran a series of articles in the local newspapers, as well as the Navy Times. We answered countless phone calls, and mailed out more than 125 application packets. Approximately 30 candidates saw subject matter advisors and applied for the program. Of those, 14 were accepted, 8 indicated that they would enroll, and 5 actually began the program in January. As late as two days before the program began, two candidates accepted positions, one with General Dynamics and one with San Diego State University.

5. Customizing Services

One of the characteristics of this program is the constant requirement for intensive contact with these candidates. They seem to require more support than our ordinary candidates. Leaving the predictable world of the military for the unpredictable world of higher education clearly appears to be traumatic.

Conclusion

As the project develops, we will continue to explore the question of cost v. benefit. Clearly we are attracting some high quality candidates to the profession. Yet the number of candidates is disappointing, and compared to the cost, a very expensive process. That same conclusion has been reported in many other projects that have sought to attract mid-career civilian and military candidates to teaching.

As this cohort proceeds through this program, we will continue to examine proposals for alterations and improvements that would make this project more viable. One possible alteration would be to develop special support services but allow candidates to go though the regular program. Another idea would be to have these students in a regular program first semester with regular candidates but establish special seminars and extra student teaching experiences for them. Other possible variations are also possible. A final report at the conclusion of the project will describe some of our conclusions at that time.

Certainly the issue of attracting the very best to the teaching profession, particularly in mathematics and science, is

not one that will go away soon. As Japan and other countries of the Pacific Rim continue to flourish, and as the European nations prepare for the elimination of trade barriers in 1992, our capacity to survive, particularly to compete economically, will be measured more by our ability to maintain educational equality with our friends than by our military strength with our adversaries.

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